

A. Vaheeda
Bga 0076



BHARAT ELECTRONICS LIMITED
CORPORATE OFFICE, BANGALORE

PROBATIONARY ENGINEERS SELECTION TEST - ~~Computer Science~~

(COMPUTER SCIENCE)

IMPORTANT : Please read instructions before answering

Max. Time: 120 Min.
Max. Marks : 100

INSTRUCTIONS TO CANDIDATES

1. **The valuation will be done by computer scanning.** Use HB pencil only. The answer sheets marked by fountain pen / ball point pen will not be valued.
2. Write your Name and Roll No. using pen, only in the space provided in the answer sheet and nowhere else. Shade the appropriate space of roll no. and discipline using pencil. You should also sign in the place provided for.
3. Each question contains 4 possible answers, only one of which is correct. Read the questions carefully and mark the answer which you decide as correct, by shading the corresponding box with HB pencil in the answer sheet. If you change your mind, erase your earlier shading completely and unambiguously by an eraser and shade again against the correct answer. Do not shade more than one answer for each question. That will disqualify the answer and will attract negative marks.
4. The supervisor will give instructions on when to begin answering and when the time is over. Failure to obey this or any other instructions of the supervisor may result in disqualification of the candidate.
5. Slide Rules, Log Tables and Non-programmable calculators may be used, if necessary.
6. There are 100 questions in this Test paper. All questions carry equal marks.
7. Do not guess or give chance answers. **Wrong answers will entail negative marks.**
8. The completed answer sheet and the question booklet should be handed over back to the Supervisor.

□ □

COMPUTER SCIENCE

1. The execution time for Binary search algorithm is
 - a) $O(n \log_2 n)$
 - b) $O(n^2)$
 - c) $O(\log_2 n)$
 - d) $O(n^2 \log_2 n)$
2. 'List' is defined as a
 - a) linear array of items of a homogeneous data structure to represent unspecified number of elements
 - b) infinite sequence of atoms or lists
 - c) finite sequence of atoms or lists
3. A railway shunting system is analogous to a
 - a) Linked list
 - b) Stack
 - c) FIFO
 - d) Linear array
4. A well known algorithm for finding the greatest common divisor for two real number is
 - a) Wirth
 - b) Knuth
 - c) Euclid
 - d) none
5. If a child in a data relationship has more than one parent then the relationship can be described as
 - a) Hierarchical
 - b) Tree
 - c) Plex
 - d) RDB
6. The concept of double buffering allows
 - a) Larger block sizes to be input and output
 - b) Twice as many logical records to be stored per physical block
 - c) I/O in one buffer to overlap processing in the other
 - d) Buffer space to be dynamically allocated
7. A binary search tree is defined as
 - a) a finite set of nodes which either is empty or consists of root node with two disjoint binary trees
 - b) a binary tree used for searching
 - c) a binary tree such that for each node all keys with left subtree of the node are less than the key with node and those in the right subtree or greater than the key in the node
 - d) a binary tree whose nodes contain keys arranged in descending order along every path from the root to a leaf

8. For which of the applications is a sequential file appropriate?
- a) Airline reservation systems
 - b) Online inventory systems
 - c) Monthly billing systems
 - d) None of the above
9. During input/output operations it is often necessary to pass each character through the processor to/from memory. There is a technique which allows the processor to be bypassed in these operations. Which of the following terms describe this process ?
- a) DASD (Direct Access Storage Device)
 - b) DMA (Direct Memory Access)
 - c) ECS (Extended Core Storage)
 - d) MMIO (Memory-Mapped Input Output)
10. In the ISO reference model of open systems interconnection, the term interface refers to
- a) the software dialogue between layers on a host
 - b) the electrical connection between machines
 - c) the dialogue at the communication subnet boundary
 - d) the transport protocol
11. If a is an array and k is an integer then fun1(&a [k]) and fun1(a+k) in C are
- a) same ~~b) different~~ c) illegal d) none of the above
12. nroff and troff are
- a) File systems in UNIX
 - b) Text formatting tools in UNIX
 - c) Data manipulation tools in UNIX
 - d) System calls of UNIX
13. fork() system call in UNIX
- a) is the normal means of terminating a process
 - b) overlays the calling process with a predefined file
 - c) creates a new process core image which is a copy of that of the caller of fork
 - d) none of the above
14. SCCS in UNIX refers to
- a) a device driver
 - b) a collection of utilities that assist in managing software
 - c) a validation tool
 - d) a verification tool

(2)

5. Which one of the following best characterises the hash coding table search technique ?

- a) The technique is applicable only to single word character strings
- b) The search time increases with the size of the table
- c) The search time is independent of the number of active table entries
- d) The initial probe is a function of the search argument

16. Instruction look ahead is useful

- a) to increase cpu execution speed
- b) to have uniform execution time
- c) for faster execution of control transfer instructions
- d) to prefetch instructions

17. Semaphores are used

- a) to pass values
- b) to synchronise processes
- c) to flag error message
- d) to prevent dead locks

18. The arithmetic operators are overloaded in

- a) C++
- b) C
- c) PASCAL
- d) All languages

19. Information hiding gives

- a) to the programmer all implementation details
- b) to the implementor all implementation details
- c) to the programmer all details to use the modules
- d) a facility to hide all information

20. A procedure that calls itself directly or indirectly is called a

- a) nested procedure
- b) looping procedure
- c) recursive procedure
- d) isomorphic procedure

21. Nodes in a tree that have the same parent node are called

- a) branch nodes
- b) siblings
- c) children
- d) subtrees

22.

```
# include <stdio.h>
# define PRINT (int) printf ("int = %d\n" , int)
main()
{
    int x = 1, y = 1, z = 1
    x += y + =z;
    PRINT (x < y ? y : x );
}
```

The above program prints

- a) 4
x < y ? y : x = 3

- b) 3
d) x < y ? y : x = 2



23. `char (*(* x [4]) ()) [5]` in C means

- a) x is an array [4] of pointer to function returning pointer to array [5] of char
- b) x is a function of an array [4] of pointer returning pointer to array [5] of char
- c) x is a function returning an array of pointer [4] pointing to array [5] of char
- d) x is a character pointer array [4] to function returning pointer to array [5] of char

24. The reverse polish expression of $a+b*c-d/e*h$ is

a) $abc*+de/h*-$
c) $abc-*de/h++$

b) $abc+*de/h-*$
d) $abc*-de/h++$

25. `# include <stdio.h>`

```
main()
{
    static struct S1 {
        char c[4], *s;
    } s1 = {"abc" , "def" } ;
    printf("%c %c\n", s1.c[0], *s1.s);
}
```

The above program prints

- a) abc def b) abc ef c) a e d) a d

26. `#include <stdio.h>`

```
#define FUDGE(k) k+3.14159
#define PR(a) printf("a = %d\t", (int) (a))
#define PRINT(a) PR(a); putchar ('\n')
main()
{
    int x=2;
    PRINT( x*FUDGE (2) );
}
```

The above C program prints

- x*FUDGE(2) = 10 b) 5 c) 10 d) x*FUDGE(2) = 7

27. A system using a single bus for data and addresses on the same lines is best described by which of the following

- a) asynchronous bus
multiplexed bus b) synchronous bus
d) simplex bus

28. The number of layers in the ISO OSI reference model is

- a) 4 b) 5 c) 6 d) 7

Gateways are used in Networks to

- a) copy individual bits between cable segments
- b) store and forward frames between LANs
- c) store and forward packets between dissimilar networks
- d) provide interfacing in higher layers

Q. The term 'Waterfall model' is associated with

- a) the flow of water through a fountain
- b) software life cycle
- c) software testing
- d) software configuration management

1. Data transfer in a digital communication system is performed in

- a) serial order
- b) parallel
- c) serial with an accompanying data strobe
- d) a balanced serial order

2. `#include <stdio.h>
main ()
{`

```
    int x,y,z ;  
    x = y = z = 1;  
    ++x || ++y && ++z ;  
    printf("x=%d y=%d z=%d\n" , x,y,z) ;  
}
```

The above C program prints

- | | |
|----------------|----------------|
| a) x=2 y=1 z=1 | b) x=2 y=2 z=2 |
| c) 2 1 1 | d) 2 2 2 |

13. Backus Naur Form is frequently used

- a) to represent the syntax of a language
- b) to represent a data structure
- c) for the form design
- d) to represent test vectors during software testing

14. Simpson's rule is useful for

- a) solving numerical linear algebra problems
- b) solving numerical integration problems
- c) curve fitting of measured data
- d) calculating eigen values of a matrix

35. # include <stdio.h>
int a[] = { 0,1,2,3,4 } ;
main ()
{
 int i, * p ;

 for (p = &a[0] ; p<=&a[4] ; p++)
 printf("*p = %d\t", *p);
}

The above C program prints

- a) *p = a[0] *p = a[1]*p = a[2]*p = a[3]*p = a[4]
- b) *p = &a[0]*p = &a[1]*p = &a[2]*p = &a[3]*p = &a[4]
- c) *p = 0*p = 1*p = 2*p = 3*p = 4
- d) none of the above

36. The maximum number of nodes in a binary tree of height h is

- a) 2^{h+1}
- b) $2^h - 1$
- c) $2^{h+1} + 1$
- d) $2^h + 1$

37. If A is a matrix of order $m \times n$, B is a matrix of order $n \times p$ and C is also a matrix of order $n \times p$ then $A(B+C) = AB+AC$

- a) is always true
- b) is sometimes true
- c) is never true
- d) none of the above

38. The ability of a software written for one computer to run successfully on a different machine is called

- a) code efficiency
- b) multiple access
- c) portability
- d) multiprogramming

39. # include <stdio.h>
main()
{
 int x,y;
 x=y=0;
 while (y<10) ++y;x += y;
 printf ("x=%d y=%d\n", x,y);
}

The above C program prints

- a) x = 10 y = 10
- b) x = 11 y = 10
- c) x = 55 y = 10
- d) x = 10 y = 55

(A)

40. # include <stdio.h>
main ()
{
 double d=3.2, x;
 int i = 2, y;

 x = (y=d/i) *2 ;
 printf("x=%d y=%d\n", x,y) ;
}

The above C program prints

- a) x = 4 y = 2
- b) x = 2 y = 1
- c) x = 2 y = 2
- d) x = 3 y = 3

41. The degree to which data in a database system are accurate and correct is referred to by which of these terms?

- a) data independence
- b) data security
- c) data integrity
- d) data privacy

42. Associative memory is illustrated by which of the following?

- a) the address of the data is supplied by the user
- b) the address of the data is generated by the CPU
- c) there is no need for an address; the information, i.e. the data, is(are) used as an address
- d) the data are accessed serially

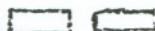
43. Page fault frequency in an operating system is reduced when the

- a) processes tend to be CPU-bound
- b) locality of reference is applicable to the process
- c) processes tend to be I/O-bound
- d) shortest remaining time scheduling is used

44. A queue of characters currently contains : a, b, c, d. What would be the contents of the queue after the following operations :

1. A deletion
2. The addition of w then of x
3. A deletion
4. The addition of y

- a) a, b, c, w, y
- b) y, x, c, d
- c) y, x, w, a, b
- d) c, d, w, x, y



45. Which of the following class of statements usually produces no executable code when compiled?
- a) assignment statements b) sequence control statements
c) structural statements d) declaration statements
46. The only state transition initiated by the user process itself in an operating system is
- a) dispatch b) block c) timer runout d) wakeup
47. What is the two's complement representation of -5/8?
- a) 1.0110 b) 0.1010 c) -0.1010 d) 1.0100
48. How many bits does one need to encode all twenty-six letters, ten symbols, and ten numerals?
- a) 5 b) 6 c) 7 d) 46
49. Increasing the precision of the REAL data type requires using at least one additional bit in
- a) the mantissa
b) the exponent
c) both the mantissa and the exponent
d) either the mantissa or exponent
50. The accuracy associated with the data types and their use is most closely related to
- a) the number of bits used to represent the mantissa
b) the number of bits used to represent the exponent
c) the use of two's complement as opposed to one's complement arithmetic
d) the sequence of operations performed in evaluating an arithmetic expression
51. A sequential circuit is to output a ONE when an even number (≥ 0) of one's are input; otherwise the output is a ZERO. The minimum number of states required is :
- a) 0 b) 1 c) 2 d) 3
52. A one - to four- line demultiplexer is to be implemented using a memory. How many words of memory are required, and how many bits must each word have ?

Words Bits

- (a) 4 1
b) 4 4
c) 4 2
d) 3 4

(3)

2 6
1 0

- □
3. Which of the following represents a universal logic family ?
a) {NAND} b) {XOR} c) {AND} d) (a) and (b) only
54. How many 1's are present in the binary representation of :
 $3 \times 512 + 7 \times 64 + 5 \times 8 + 3$?
a) 8 b) 9 c) 10 d) 11
55. Which are the characteristics of horizontal microinstructions?
I Longer control word than vertical microinstructions
II High degree of parallelism
III Their execution slower than vertical instructions
a) I only b) II only c) III only d) I and II only
56. The output of a lexical analyser is
a) intermediate code b) a stream of tokens
c) a parse tree d) possibly optimised machine code
57. Which case or cases following leads to a pipelined computer architecture?
I) The evaluation of each basic function is relatively independent of the previous one
II) The subfunction are closely related to each other
III) The evaluation of each subfunction requires approximately the same sequence
a) I only b) II only c) III only d) I,II, and III
58. A computer communications system uses a unique 8 bit pattern 01111110 to mark the beginning and end of a frame. Suppose that this pattern appears in the information part of the frame and is subjected to bitstuffing; to what would be the sequence be changed?
a)...00111110... b)...01111100...
c)...011111010... d)...01011110...
9. A five-bit representation is used for integers. If the operation -8 -8 is performed, in which system(s) will overflow occur?
a) two's complement only
b) one's complement only
c) sign-and-magnitude and one's complement
d) one's and two's complement

- □
60. The total time to prepare a disk drive mechanism for a block of data to be read from it is
- a) latency
 - b) seek time
 - c) transmission time
 - d) latency plus seek time
61. What will be the output of the following program segment? (Given that ASCII Codes are used and that the codes for the lowercase letters are greater than of the uppercase letters)
- ```
char c ;
c = 'C' + 'a' - 'A' + 2 ;
printf (" %c" , c);
```
- a) a
  - b) p
  - c) d
  - d) r
62. The following code segment is supposed to print out letters from 'a' to 'z'. What is the smallest piece of code possible to substitute for XXX so that the program does this?
- ```
char c = 'a' ;
while (c ++ <= 'z') putchar (XXX) ;
```
- a) c --
 - b) c
 - c) c - 1
 - d) c++
63. The following program segment is supposed to find the number of lowercase letters in the input. There is a bug in one of the lines in the program
- ```
lower = 0 ;
while ((c = getchar()) != EOF) {
 if ((c >= 'a') || (c <= 'z'))
 lower ++ ;
}
```
- Which of the choices below is the correct version of the line?
- a) lower = 1;
  - b) if ((c>= 'a') && (c < 'z' ))
  - c) ++ lower;
  - d) if (( c>= 'a' ) && (c <= 'z'))
64. In the following segment of "C" code, which of the lines has a syntax error?

```
char *a, *b, c[100], d [100] ;

a = b ; (1)
b = d ; (2)
c = a ; (3)
a = c ; (4)
```

- a) 1
- b) 2
- c) 3
- d) 4

(6)

70. A raster colour display processor supports a resolution of 1024x800 with upto 16 million colours simultaneously displayable. What would be the size in bytes of the frame buffer used in the display processor? Choose the closest value from the following

- a)  $1.2 \times 10^6$       b)  $2.4 \times 10^6$   
c)  $16.0 \times 10^6$       d)  $1.0 \times 10^5$

71. Which of the following combination of gates does not allow the implementation of an arbitrary Boolean function?

- a) OR gates and inverters only  
b) NAND gates only  
c) OR gates and exclusive OR gates only  
d) OR gates and AND gates

72. Alka is taller than Vijay, Pradeep is shorter than Vijay but taller than Laxmi. Which of the following conditions ensures that Bina is taller than Pradeep?

- a) Laxmi and Vijay are taller than Bina  
b) Alka is taller than Bina  
c) Alka is shorter than Bina  
d) Laxmi and Bina are of the same height

73. A four digit number is formed with digits 2,3,4,5, with every digit occurring once only. Find the sum of all such four digit numbers.

- a) 15554      b) 5432      c) 284419      d) 93324

74. What is the value of

$$x = -\log_2 \log_2 \sqrt{2}$$

- a) -1      b) 1      c) 2      d) 3

75. Fill up the blank with the most appropriate word.

A computer program can often be a very satisfactory ----- of a physical system such as road traffic conditions in Bombay

- a) solution  
c) simulation      b) replacement  
d) demonstration

76. Floating point numbers in a computer are represented using a 10 bit mantissa (including a sign bit) and a 6 bit exponent (including a sign bit). What is the approximate value of the maximum number which can be represented? Assume that the mantissa is stored in the normalised form, that is without leading zeroes.

- a)  $2^{64}$       b)  $2^{63}$       c)  $2^{32}$       d)  $2^{31}$



1. Which one of the following statements is always true ?
- a) A compiled program uses more memory than an interpreted program
  - b) A compiler converts a program to a lower level language for execution
  - c) A compiler for a high level language takes less memory than its interpreter
  - d) Compiled programs take more time to execute than interpreted programs
78. Suppose a system has been evolved, called the ternary system, by creatures having only 3 fingers. Numbers in this system are written down, using the digits 0, 1, and 2, with  $2 > 1 > 0$ . What will be the binary equivalent of 222 in this system
- ~~1~~ 101010      b) 11000  
c) 10110      d) 11010
79. What will be the value of the PASCAL expression :  $4 + 6 \text{ DIV } 3 * 2 - 2$ ?
- a) 3      b) 4      c) 5      d) 6
80. Consider the following program segment :
- ```
i := 6720;
j := 4;
WHILE (( i mod j) = 0) DO
BEGIN
    i := i div j ;
    j := j + 1
END ;
```
- What will be the value of j on termination of the segment?
- a) 4 b) 8 c) 9 d) 6720
81. If $a = 9$, $b = 5$ and $c = 3$, what can be inferred about the value of the following expression ?
- $a - a \text{ div } b * b \text{ mod } c > a \text{ mod } b \text{ mod } c$
- a) FALSE b) TRUE c) An Invalid expression d) 1
82. Consider the following program segment
- ```
j := 2 ; WHILE (i MOD j) <> 0 DO j := j + 1 ;
IF j < i THEN WRITE (j)
```
- For a given  $i \geq 2$ , this program segment prints j only if
- a) i is a prime      b) j does not divide i  
c) j is odd      d) i is not a prime

(7)

83. The statement READ(x) reads in a number and stores it in the variable x. The following program segment reads in a sequence of numbers a(1), a(2), a(3) ----- a(n).

```
i := 1 ; READ (x) ; p := x ; q := x ;
WHILE i < n DO
 BEGIN
 READ (x) ; i := i + 1 ;
 IF x > p THEN p := x
 ELSE
 IF q > x THEN q := x
 END
```

After the execution of the above program segment which of the following statements is not true?

- a) if  $a(1) < a(2) < a(3) < \dots < a(n)$  then the value of p is a(n) and that of q is a(1).
- b) It picks the largest and smallest values of a(1)...a(n) in p and q respectively
- c) For some k such that  $1 < k < n$  with  $a(1) < a(2) < a(3) < \dots < a(k)$  AND  $a(k+1) > a(k+2) > a(k+3) > \dots > a(n)$  AND  $a(k+1) > a(k)$ , the value of p will be a(k+1) and that of q will be a(n)
- d) The WHILE loop is executed (n-1) times even if  $a(1)=a(2)=a(3)=\dots=a(n)$ .

84. Which of the following best describe the technique found in architectures known as memory-mapped I/O ?

- a) The architecture provides special instructions for manipulating input/output ports
- b) Input/output ports are placed at addresses on the bus and are accessed just like other memory locations
- c) To perform an input/output operation all you need to do is place the data in an address register and call the channel to do the operation
- d) Ports are referenced only by memory-mapped instructions of the architecture and are located at hardwired memory locations

85. What problem is of concern to the designer of a memory card with dynamic RAM chips, that is not of concern to the designer of a memory card using only static RAM chips? Select the best answer below

- a) the need to design a 'memory busy' handshake signal
- b) The need for 'refresh' circuits and associated controls
- c) The need to design a special output buffer to stabilize the data bit values
- d) The need to put inverters at the data outputs

③



70. A raster colour display processor supports a resolution of 1024x800 with upto 16 million colours simultaneously displayable. What would be the size in bytes of the frame buffer used in the display processor? Choose the closest value from the following

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c)  $\sim 16.0 \times 10^6$

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- 64                63                32                31  
a) 2                b) 2                c) 2                d) 2

83. The statement READ(x) reads in a number and stores it in the variable x. The following program segment reads in a sequence of numbers a(1), a(2), a(3) ----- a(n).

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(3)



ASE stands for

- ) Computer Aided Systems Engineering
- ) Computer Aided Software Entertainment
- :) Computer Aided Simulation Entry
- ) Computer Aided Software Engineering

The minimum number of 2- input NAND gates required to implement a 2-input Exclusive OR function is

- a) 2
- b) 4
- c) 3
- d) 6

The population covered between 3 standard deviations of the mean of a normal distribution is

- a) 99.73%
- b) 68.26%
- c) 95.4%
- d) 50%

The probability of drawing 2 aces in succession from a pack of 52 cards is

- a)  $1/221$
- b)  $1/169$
- c)  $2/13$
- d) 0.1

IEEE - 488 is a standard for

- a) Computer I/O architecture
- b) Connecting instruments to the computer
- c) Networking
- d) None of the above

Choose the incorrect statement from the following about the basic ray tracing technique used in image synthesis :

- a) In this technique rays are cast from the eye point through every pixel on the screen
- b) In this technique viewing transformations are not applied to the scene prior to rendering
- c) This technique removes hidden surfaces
- d) In this technique rays are cast from the light source to the objects in the scene.

Which of the following statement is correct

- a) request, sample and event are the three basic modes of input
- b) a keyboard is a device ideally suited for use in the ample mode
- c) a mouse is typically a device for inputting an absolute position on the screen
- d) special graphics hardware support is essential for providing a menu driven user interface to an application.

⑨

98. Given the functional dependencies  $X \rightarrow W$ ,  $X \rightarrow Y$ ,  $Y \rightarrow Z$  and  $Z \rightarrow PQ$

Which one of the following does not hold ?

- a)  $X \rightarrow Z$    b)  $W \rightarrow Z$    c)  $Z \rightarrow Q$    d)  $X \rightarrow WY$

99. The Data Flow Model of an application mainly shows

- a) The underlying data and the relationships among them  
b) Processing requirements and the flow of data  
c) Decision and control information  
d) Communication network structure

100. Which of the following testing methods is normally used as the acceptance test for a software system ?

- a) Functional testing  
b) Unit testing  
c) Integration testing  
d) Regression testing